

Curriculum Vitae

Xusheng Luo

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RESEARCH INTERESTS

Robotics, Task and Motion Planning, Formal Verification and Synthesis with application in Autonomous Systems, Control.

EDUCATION

Ph.D. in Mechanical Engineering (Robotics Track)

Duke University, Durham, NC, U.S.

Aug. 2017 - Nov. 2020

- Dissertation: *Scalable Control Synthesis for Multi-Robot Systems under Temporal Logic Specifications*
- Advisor: Michael M. Zavlanos
- Relevant Coursework: *Machine Learning, Artificial Intelligence, Dynamic Programming & Optimal Control, Numerical Methods for Nonlinear Optimization, Program, Data Structure & Algorithm in C++, Intro to Model Predictive Control, Linear System Theory, Intro to Mathematical Statistics, Probability.*

M.Sc. in Mechanical Engineering (Robotics Track)

Duke University, Durham, NC, U.S.

Aug. 2017 - May. 2020

- Advisor: Michael M. Zavlanos

M.Sc. in Aeronautical and Astronautical Science and Technology

Harbin Institute of Technology, Harbin, China

Sep. 2015 - July 2017

- Thesis: *Key Techniques of Multi-Source Information Fusion in Integrated Navigation System*
- Advisor: Wuxing Jing

B.Sc. in Flight Vehicle Design and Engineering

Harbin Institute of Technology, Harbin, China

Aug. 2011 - July. 2015

- Thesis: *Autonomous Navigation for Mars Probe Using Celestial Objects and Landmarks*
- Advisor: Wuxing Jing

PUBLICATIONS Journal Articles

- J1. **X. Luo** and M. M. Zavlanos, "Temporal Logic Task Allocation and Motion Planning in Multi-Robot Systems", *International Journal of Robotics Research*, October 2020 (under review).
- J2. **X. Luo** and M. M. Zavlanos, "Transfer Planning for Multi-Robot Systems under Temporal Logic Specifications", *IEEE Transactions on Robotics* (in preparation).
- J3. **X. Luo**, Y. Kantaros, and M. M. Zavlanos, "An Abstraction-Free Method for Multi-Robot Temporal Logic Optimal Control Synthesis", *IEEE Transactions on Robotics* (conditionally accepted).
- J4. **X. Luo**, M. Pajic, and M. M. Zavlanos, "An Optimal Graph-Search Method for Secure State Estimation", *Automatica*, September 2020, accepted to appear

Conference Proceedings

- C1. **X. Luo***, Y. Zhang*, and M. M. Zavlanos, "Socially-Aware Robot Planning

*Equal contribution.

via Bandit Human Feedback”, ACM/IEEE 11th International Conference on Cyber-Physical Systems (ICCPS), Sydney, Australia, April, 2020, pp. 216-225.
Acceptance rate: 23.8% (24 of 101)

- C2. D. M. Le, **X. Luo**, L. J. Bridgeman, M. M. Zavlanos, and W. E. Dixon, “Single-Agent Indirect Herding of Multiple Targets using Metric Temporal Logic Switching”, IEEE 59th Conference on Decision and Control (CDC), Jeju Island, South Korea, December 2020.
- C3. Y. Zhou, Y. Zhang, **X. Luo**, and M. M. Zavlanos, “Human-in-the-Loop Robot Planning with Non-Contextual Bandit Feedback”, IEEE International Conference on Robotics and Automation (ICRA), Xian, China, 2021 (under review).
- C4. S. Sun, Y. Zhang, **X. Luo**, P. Vlantis, and M. M. Zavlanos, “Formal Verification of Stochastic Systems with ReLU Neural Network Controller”, IEEE International Conference on Robotics and Automation (ICRA), Xian, China, 2021 (under review).
- C5. **X. Luo** and M. M. Zavlanos, “Transfer Planning for Temporal Logic Tasks”, IEEE 58th Conference on Decision and Control (CDC), Nice, France, December 2019, pp. 5306–5311.

RESEARCH EMPLOYMENT

Research Assistant

Duke University, Durham, NC, U.S.

Aug. 2017 - Nov. 2020

- Zavlanos Lab, Department of Mechanical Engineering and Materials Science
- Developed a sampling-based planning algorithm named TL-RRT* for the multi-robot temporal logic optimal control synthesis problem.
- Developed an optimal control synthesis algorithm for temporal logic specifications by exploiting experience from solving similar tasks before.
- Developed a hierarchical approach to optimally allocate tasks, captured by global temporal logic specifications, to teams of heterogeneous mobile robots.
- Developed an optimal graph-search method for secure state estimation in large-scale cyber-physical systems modeled as linear time-invariant systems.
- Designed collision-free, dynamically feasible, and socially-aware trajectories for robots operating in environments populated by humans.
- Collaborated on the safety verification problem of a stochastic dynamical system with a ReLU neural network controller.

Research Assistant

Harbin Institute of Technology, Harbin, China

Sep. 2015 - July 2017

- Autonomous Space System Lab, Department of Aerospace Engineering
- Developed a capturing and braking strategy for a Mars probe with finite thrust.
- Designed an autonomous navigation algorithm for a Mars probe using celestial objects and landmarks.

HONORS & AWARDS

1. **Student Travel Grant** for the IEEE 59th Conference on Decision and Control 2020
2. **Fellowship** of the Department of Mechanical Engineering and Material Science at Duke University 2017
3. **Outstanding Graduate (Gold Medal)** of Harbin Institute of Technology 2015, 2017
4. **The Samsung Scholarship** 2016
5. **Scholarship** of the Summer School at Technion – Israel Institute of Technology 2016
6. **National Scholarship for Encouragement** 2012, 2014
7. **First-Class Peoples Scholarship** 2012–2015

REFERENCES

Michael M. Zavlanos

- Professor at the Department of Mechanical Engineering and Materials Science at Duke University
- `michael.zavlanos@duke.edu`

Georgios Fainekos

- Professor at the School of Computing, Informatics and Decision Systems Engineering at Arizona State University
- `fainekos@asu.edu`

Miroslav Pajic

- Professor at the Department of Electrical and Computer Engineering at Duke University
- `miroslav.pajic@duke.edu`